

"Again I say to you, that if two of you agree on Earth about anything that they may ask, it shall be done for them by My Father who is in Heaven.

Holy Bible, Matthew 18:19

It seems like for the time being Russia is considered as part of Europe in the matter of creating new microelectronics devices, and this gives us a chance.

Gennady Krasnikov: Magazine Expert, No. 25 (808), 25.06.2012

Model of Open Innovation IMEC IIAP: a View from Russia

Introduction

The process of electronics engineering development through cooperation began to gain momentum in the late 1980s and immediately formed two directions: horizontal and vertical. The horizontal one (Fables and Foundry in all their variety) has established a number of business models which separated developers and contract manufacturers of bulk product. The vertical one (from the producers of materials and structures to components, assemblies, units and systems) led to the formation of alliances of producers of final consumer products. Both processes have been objectively sufficient both by the rapidly increasing speed of creating and occupation of new market niches and by the excessive increase in the prices of creating new production facilities for integrated circuits and on-chip systems.

The explosion happened at the end of the first decade of the 2000s when the Peoples Republic of China sent a clear message that it claims to be the leader in the world economy. First, a collapse was arranged of world prices for silicon which is the base material of electronic equipment, following which the PRC imposed restrictions for the exportation of rare earth metals whose prime application area is a wide range of displays. Many manufacturers that were successful participants of the horizontal cooperative system proved to be completely dependent on the PRC. A number of international global companies which produced finished products such as solar panels became bankrupts, and the Chinese quickly and cheaply bought their shares.

Several countries such as USA responded strictly to that situation which in many ways they have generated themselves. Their first reaction was to revive immediately their own production.

However the Chinese shot was strong but not fatal:

- The image and industrial capacity of other South-East Asian countries rose sharply.
- Business development centers with their own new product prototyping lines (the fab-lite model) started to emerge more intensely.

- Requirements to participation in cooperation became stricter, and in addition to cheap labor and high professionalism, the reputation of a manufacturing country and the company representing it started to be taken into account.

Problem

A real threat to the development of micro and nano electronics came from the other side. The cost of R&D started to rise sharply.

Chip production income (green line) and cost of R&D (red line) in \$ Millions.

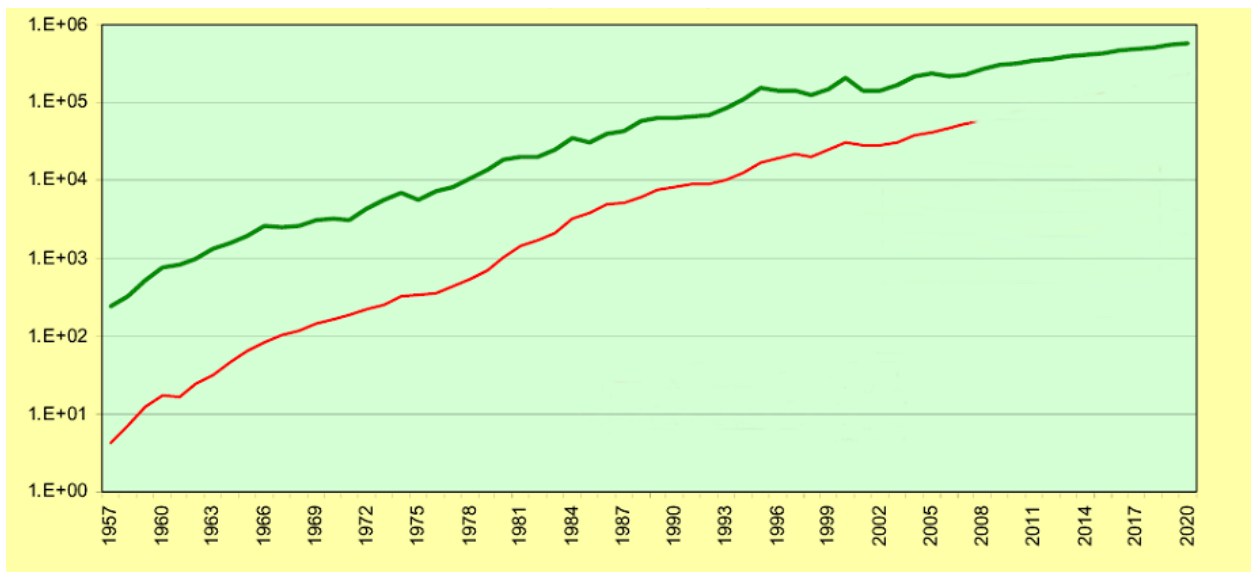


Fig.1. Growth of R&D Costs Which is Faster than Revenue Growth in the Electronics Industry.

Solution offered by IMEC

To minimize the risks of micro and nano electronics development, Interuniversity Micro Electronics Centre (IMEC) http://www2.imec.be/be_en/home.html proposed using the Open Innovation Model (IMEC's Industrial Affiliation Program, IIAP's or IMEC's Industrial Incorporation Program) for R&D within individual technology platforms.

According to this model, companies entering partner team within a single technology platform (Fig. 2):

- Share intellectual property (IP) on the basis of bilateral agreements with IMEC (except the base facilities of their businesses).
- Share risks.
- Share expenses.
- Share design engineers' capabilities.

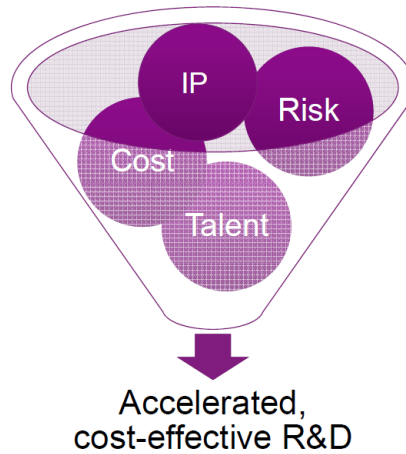


Fig.2. Rapid and Efficient R&D Version in Terms of Costs (with the Permission of IMEC)

The general scheme of IMEC Open Innovation includes:

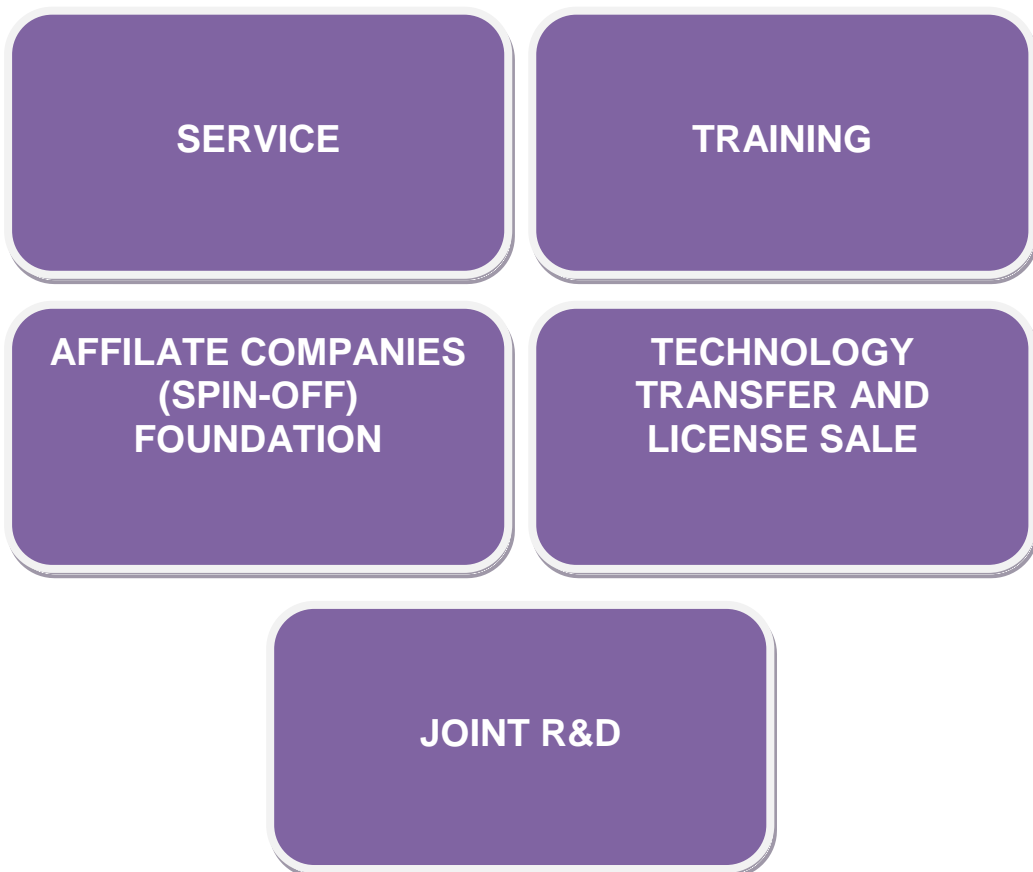
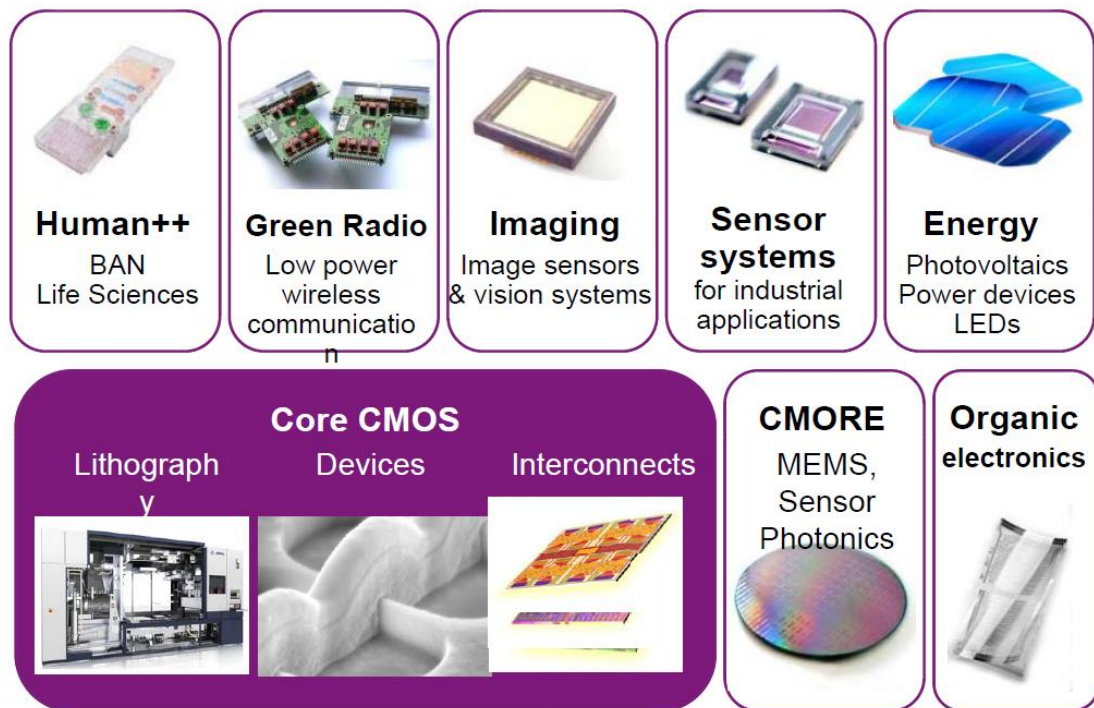


Fig. 3. Mechanisms of Implementing the Open Innovation Model in IMEC

IMEC TECHNOLOGY PLATFORMS PROMISING FOR CONSORTIUM

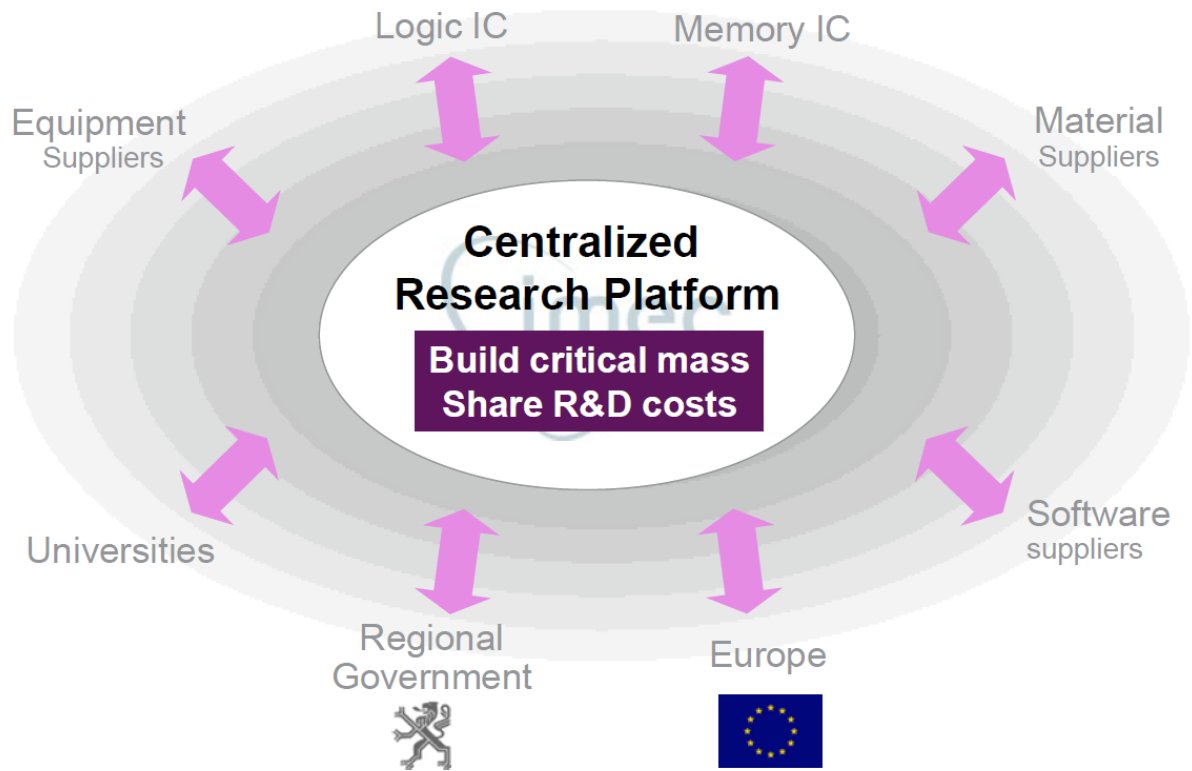


IMEC data

Fig. 4. IMEC's Basic Technological Platforms

1. Medico-biological devices: in relation to the human body and the environment.
2. "Green Radio" or low-power wireless communication systems.
3. Image systems including video sensors and imaging systems.
4. Sensor systems for industrial application.
5. Power industry including photocells, high power devices and laser diodes.
6. IMEC developed the MEMS systems technology with the use of polycrystalline SiGe and combined it with the conventional CMOS technology which provided for a drastic improvement of their parameters. For example, gyros with unique characteristics were created.
7. Organic electronics.
8. The CMOS technology remains IMEC's core competence, in particular, lithography systems, device structures and interconnections.

Fig. 5. Structure of IMEC's Centralized Research Platform.



IMEC data

Fig. 5. Contribution of Different Organizations and Companies to IMEC's Integrated Research Platform.

Intellectual Property Issues

The key aspect of IP objects usage and creation is the ownership issue. In accordance with the Open Innovation Model, the issue of IP disclosure to the partners is solved as follows:

In all IP used in the works within the aforementioned IMEC platforms the Centre is co-owner of the IP share under the respective bilateral agreement where this issue is agreed and documented at an early stage of cooperation. Exceptions are the IP objects which are the key value to the business of the partner company, and such IP is 100% owned by the project participant.

Below are the basic provisions regarding IP objects in the Open Innovation Model:

1. **Partner becomes a co-owner (as well as IMEC) of intellectual activity results, and this becomes its contribution to the joint venture.**
2. Partner acquires a non-exclusive non-transferable license for IMEC's or other program partner's intellectual activity results not related to the activities of its specialists during the R_1 period (the license fee is stipulated at the stage of partner inclusion in the program).
3. Partner obtains a license for the original IP it needs to use at the R_0 stage (the license fee is included in the registration fee).
4. Partner retains the exclusive right to estimate all expenses incurred while creating intellectual property results, own processes, applications etc. at the R_2 stage.
5. Partner's initial results and knowledge remain its property. **Unification of introduced IP source objects is not allowed.**

The process in which IP is the main function of the R&D cycle is illustrated in Fig. 6.

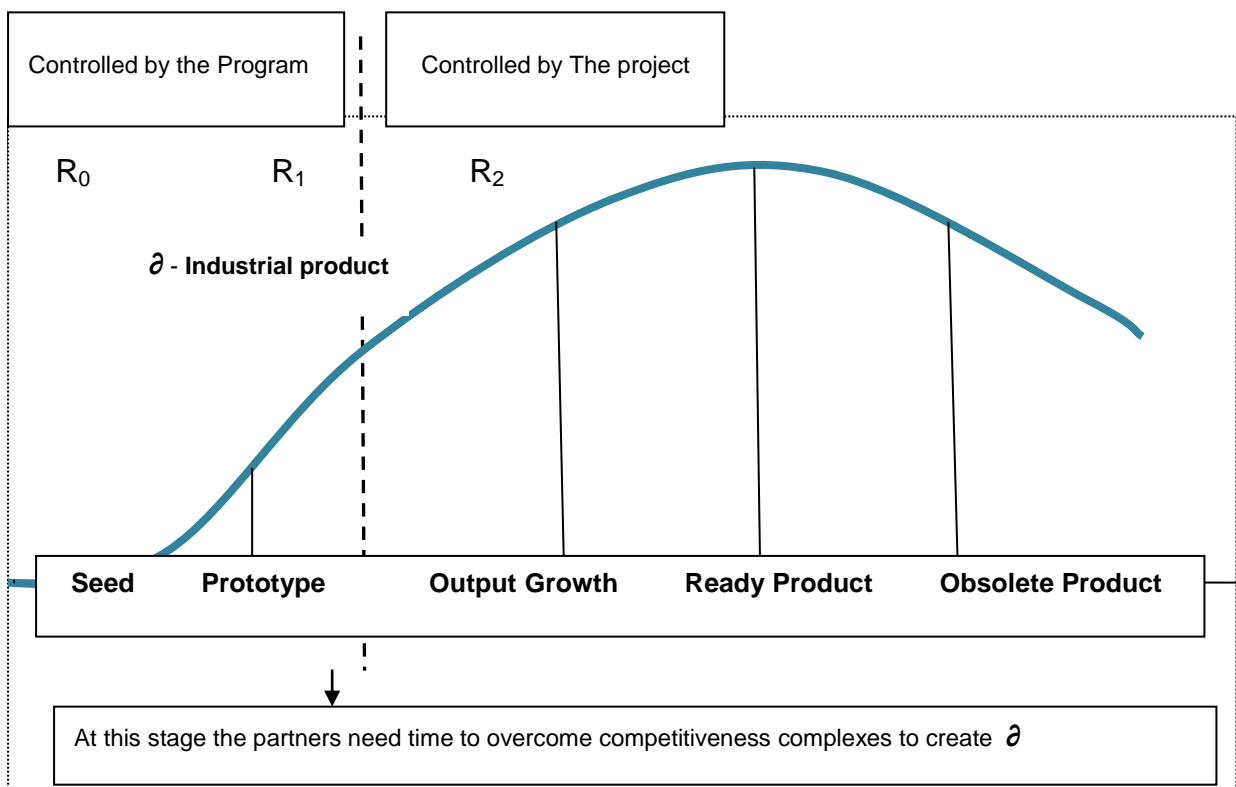


Fig. 6. Basic Cycles of New Product Development

Why IMEC?

But why was it IMEC that put forward the initiative of the Open Innovation Model and started its implementation in 2009?

Established in 1984 at the initiative of the Flanders Government and with the support of the Belgian Government, this non-for-profit organization with a number of employees of about 1,700 works on more than 10 promising major technology platforms. In its course of development IMEC outran the world's leading nanoelectronics centers by at least 3-5 years.

However, IMEC has contracts with similar centers in different countries worldwide, not only developing technological solutions for them, but also training highly skilled specialists. For 40 years IMEC earned a great reputation and good relationships with major universities, institutes and companies that exclude the possibility of conflicts of interest. This all allows this organization not only to initiate a new model but also to become a center of attraction for a wide range of partners.

According to IMEC experts the key to successful innovative solutions is carrying out joint interdisciplinary R&D which participants that share costs, risks and resultant intellectual property.

View from Russia

Over the past two millennia for historical reasons, the territory currently called Russia today became the largest natural pantries. These territories supplied the world with furs, hemp, lumber, wheat, metals, diamonds, oil and gas, and in the future they intend to export potable water. The acquisition and possession of new territories for future development of their resources is the paradigm of Russia's development.

Electronics as well as other high-tech technologies became a product possessing stimulated rather than natural necessity. Their active development in Russia began during the world wars of the 20th century and reached its pinnacle just before the loss in the cold war. The same goes to arms exportation.

Critical security technologies which protect the vast territory include highly developed telecommunications logistics system, radiolocation and offensive defense.

All these systems are based on the ECB (electronic component base) and they (ideally) should be manufacture domestically. Any foreign microchip allows the occurrence of externally driven "spies".

Considering the real threat from the East which is concern not only for Russia but also for other countries including most notably the United States, Russia enters a favorable period for creating scientific and technical alliances with leading centers of the West. This gradual and well thought-out association should enable future creation, based on

the IMEC Open Innovation Model, of several major centers of competence in Russia which can enter global technology platforms and become its full participants.

As practice of the last two decades shows, the most pragmatic model remains the one in which the Russian electronics industry is created on the basis of the Fab-lite model where a new product line prototyping center is created together with a development center. These centers also provide training for senior managers, designers and manufacturers. The created structure allows implementing the R₀ phase of the IMEC Model, conducting pilot works that are promising for patenting and licensing and, at the same time, providing small-scale deliveries to special customers.

The main difficulty of this model is that its implementation costs in Russia should be covered largely by the State. However, a solution can be found. Incubators in Russia should be supported not only by the State, but also by Russian enterprises and joint ventures legalized abroad with Russian capital and having decent income on their efficient performance in the field of commercial (consumer) electronics. So, this all looks quite optimistic for domestic electronics if it becomes part of the global Open Innovations electronics which IMEC has offered to the world.